

## Course Outline: Biotechnology

<b>CD: Biological Science Applications in Agriculture</b>				
Lesson Number and Title	Agricultural Standard(s)	Academic Standard(s)	Days	
<b>UNIT A. PLANT SCIENCE</b>				
<b>Problem Area 3. Agriculture and the Environment</b>				
AEN:BT118	Biotech: The Environmental Benefits	AE:A12-1,:A12-2, AE:A12-3	Sci:A12-5,Sci:G12-3,Sci:H12-5	1
AEN:BT119	Biotech: The Environmental Risk	AE:A12-1,:A12-2, AE:A12-3	Sci:A12-5,Sci:G12-3,Sci:H12-5	1
BSAA:A3-4	Fuels from Crops	AE:E12-1, AE:E12-6	Sci:E12-4, Sci:H12-5	1
<b>Problem Area 4. Managing Inputs for Plant Growth</b>				
LC: A4-2	Principles of Heredity: Variation in Corn	AE:D12-1	Sci:F12-3, Sci:F12-4	3
LC: A4-3	Plant Tissue Testing	AE:D12-6	Sci:F12-1	2
AEN:BT127	Improving Crop Production and Quality	AE:E12-1,AE:E12-6: E12-1	Sci:F12-3, Sci:F12-4, Sci:F12-5, Sci:F12-6	2
AEN:BT129	Developing Crops that Fight Insects	AE:E12-1 AE:E12-1, AE:E12-6	Sci:F12-3, Sci:F12-4, Sci:F12-5, Sci:F12-6	1
<b>Problem Area 7. Reproduction in Plants</b>				
LC: A7-3	Tissue Culture	AE:D12-6	Sci:F12-6	2
AEN:BT107	Genetic Engineering of Plant Life	AE:D12-5,AE:D12-6	Sci:F12-3, Sci:F12-4, Sci:F12-5, Sci:F12-6	2
<b>UNIT B. ANIMAL SCIENCE</b>				
<b>Problem Area 1. Animal Genetics and Biotechnology</b>				
LC: B1-1	Animal Genetics and Probability	AE:D12-6	Sci:F12-3, Sci:F12-4, Sci:F12-5, Sci:F12-6	4
PCSD: ALSNS-01	Selection Indexes/Predicted Difference	AE:D12-6	Sci:F12-3, Sci:F12-4, Sci:F12-5, Sci:F12-6	1
PCSD: ALSNS-02	Genomics/ DNA Fingerprinting	AE:D12-4, AE:D12-5, AE:D12-6	Sci:F12-1, Sci:F12-2, Sci:F12-3, Sci:F12-4, Sci:F12-6	6
LC: B1-2	DNA Extraction	AE:B12-4	Sci:F12-1, Sci:F12-2, Sci:F12-3, Sci:F12-4, Sci:F12-6	1
LC: B1-3	Biotechnology	AE:B12-4, AE:D12-3, AE:D12-5, AE:D12-6, AE:E12-1	Sci:F12-1, Sci:F12-2, Sci:F12-3, Sci:F12-4, Sci:F12-6, SS:E12-9	4
AEN:BT109	Producing Clones of Animals	AE:D12-3, AE:D12-5, AE:D12-6, AE:E12-1	Sci:F12-1, Sci:F12-2, Sci:F12-3, Sci:F12-4, Sci:F12-6	3
AEN:BT108	Transgenic Animals	AE:D12-3, AE:D12-5, AE:D12-6, AE:E12-1	Sci:F12-1, Sci:F12-2, Sci:F12-3, Sci:F12-4, Sci:F12-6	3
AEN:BT123	Using Pig Parts for Human Replacements	AE:D12-3, AE:D12-5, AE:D12-6, AE:E12-1	Sci:F12-1, Sci:F12-2, Sci:F12-3, Sci:F12-4, Sci:F12-6,SciF12-11,SciG12-3	1
<b>Problem Area 2. Growth and Development of Animals</b>				
LC: B2-9	Growth Hormones in Animals	AE:A12-2	Sci:F12-11	1
LC: B2-10	Effect of Antibiotics on Bacteria	AE:A12-2	Sci:D12-4, Sci:D12-5, Sci:D12-6	3

UNIT C. FOOD SCIENCE				
Problem Area 1. Handling and Storing Plant Products				
LC: C1-5	pH and Fermentation	AE:B12-4	Sci:D12-5, Sci:D12-6	1
Problem Area 2. Processing Animal Products				
LC: C2-4	Salt as a Food Preservative & Microbial Agent	AE:A12-3	Sci:D12-5	1
CD: Animal, Plant & Soil Science - Revised				
Lesson Number and Title		Agricultural Standard(s)	Academic Standard(s)	Days
UNIT A. SCIENTIFIC RESEARCH				
Problem Area 1. Conducting Scientific Investigations in Agriculture				
LC: A1-1	Research Methods in Agriculture	AE:B12-2	Sci:B12-1, Sci:B12-4	1
LC: A1-2	Designing and Conducting Agricultural Research	AE:B12-2	Sci:B12-1, Sci:B12-4	1
LC: A1-3	Reporting Agricultural Research	AE:B12-2	Sci:B12-1, Sci:B12-4	1
LC: A1-4	Agriscience Fair Projects	AE:B12-2	Sci:C12-2	1
UNIT B. INTRODUCTION TO PLANT & ANIMAL SCIENCE CONCEPTS				
Problem Area 2. Cellular Biology, Genetics, and Biotechnology				
LC: B2-1	Cells	AE:B12-4	Sci:F12-2	2
LC: B2-2	Cell Division	AE:B12-4	Sci:F12-3	2
LC: B2-3	Genetics	AE:B12-4	Sci:F12-4, Sci:F12-4	4
LC: B2-4	Heritability of Traits	AE:B12-4	Sci:F12-3, Sci:F12-4	2
LC: B2-5	Improving Agricultural Plants and Animals	AE:E12-1	Sci:G12-3	2
LC: B2-6	Organismic and Molecular Biotechnology	AE:D12-5	Sci:G12-3	1
LC: B2-7	Advantages and Disadvantages of Agricultural Biotechnology	AE:D12-5	Sci:G12-3	1
LC: B2-8	Career Opportunities in Agricultural Biotechnology	AE:E12-1, AE:E12-2, AE:E12-3	Sci:A12-5	1
AEN:BT103	Mapping and Sequencing Genetic Information	AE:D12-4,AE:D12-5, AE:D12-6	Sci:F12-1, Sci:F12-2, Sci:F12-3, Sci:F12-4, Sci:F12-6,SciF12-11,SciG12-3	4
AEN:BT104	Developing Technologies from Embryo Research	AE:D12-1, AE:D12-2, AE:D12-3, AE:D12-4, AE:D12-5, AE:D12-6	Sci:F12-1, Sci:F12-2, Sci:F12-3, Sci:F12-4, Sci:F12-6,SciF12-11,SciG12-3	3
AEN:BT105	Understanding Stem Cell Discoveries	AE:D12-1, AE:D12-2, AE:D12-3, AE:D12-4, AE:D12-5, AE:D12-6	Sci:F12-1, Sci:F12-2, Sci:F12-3, Sci:F12-4, Sci:F12-6,SciF12-11,SciG12-3	3
AEN:BT125	Genetically Engineering Vaccines	AE:D12-1, AE:D12-2, AE:D12-3, AE:D12-4, AE:D12-5, AE:D12-6	Sci:F12-1, Sci:F12-2, Sci:F12-3, Sci:F12-4, Sci:F12-6,SciF12-11,SciG12-3	1

UNIT E. PLANT SCIENCE				
Problem Area 3. Plant Propagation				
Lesson Number	Lesson Title	Academic Standard(s)	Academic Standard(s)	Days
LC: E3-2	Propagating Plants Asexually	AE:D12-5	Sci:F12-6	1
LC: E3-3	Plant-Breeding Techniques	AE:D12-5	Sci:F12-6	1
Problem Area 4. Examining Plant Growth				
LC: E4-11	Plant Growth Regulators	AE:D12-5	Sci:F12-10	1
CD: Physical Science Applications in Agriculture				
Lesson Number and Title		Agricultural Standard(s)	Academic Standard(s)	Days
UNIT C. FOOD SCIENCE				
Problem Area 1. Handling and Storing Plant Products				
AEN:FS102	Chemistry of Foods	AE:D12-5, AE:D12-6	Sci:D12-4, Sci:D12-5, Sci:D12-6	1
AEN:FS106	Avoiding Food Deterioration	AE:A12-2	Sci:D12-4, Sci:D12-5, Sci:D12-6	1
LC: C1-3	Controlling Molds with Food Preservatives	AE:A12-2	Sci:D12-4, Sci:D12-5, Sci:D12-6	2
Problem Area 2. Processing Animal Products				
LC: C2-5	Animal /Food Products as an Ecological System for Bacteria	AE:A12-3	Sci:D12-4, Sci:D12-5, Sci:D12-6	3
Problem Area 3. Agricultural Processing Systems				
LC: C3-4	Algin Worms	AE:D12-5	Sci:D12-4, Sci:D12-5, Sci:D12-6	1
AEN:FS110	Processing Foods with Radiant and Electrical Energy	AE:D12-4, AE:D12-5, AE:D12-6	Sci:D12-4, Sci:D12-5, Sci:D12-6	1
LC: C2-7	Fermentation in Food Production	AE:D12-4	Sci:D12-4, Sci:D12-5, Sci:D12-6	4

## Agricultural Standards Lookup Table:

Core Area	Content Standard	Performance Standard
<b>AE - Agricultural Education</b>	<b>AE:A - Global Agricultural Systems</b>	<b>AE:A12-1</b> - Identify how political policies and issues shape and influence food and fiber systems
<b>AE - Agricultural Education</b>	<b>AE:A - Global Agricultural Systems</b>	<b>AE:A12-2</b> - Understand the variety, complexity, and size of the agricultural industry in the world
<b>AE - Agricultural Education</b>	<b>AE:A - Global Agricultural Systems</b>	<b>AE:A12-3</b> - Describe how global interdependence benefits the production and distribution of food and fiber
<b>AE - Agricultural Education</b>	<b>AE:B - Technology/Information</b>	<b>AE:B12-2</b> - Select and communicate information in an appropriate format; e.g., oral, written, graphic, pictorial, multimedia
<b>AE - Agricultural Education</b>	<b>AE:B - Technology/Information</b>	<b>AE:B12-4</b> - Access and use information for a class presentation about the impact of new technologies on the products manufactured and produced; e.g., biotechnology
<b>AE - Agricultural Education</b>	<b>AE:D - Agriscience/Production</b>	<b>AE:D12-1</b> - Describe the global utilization of Wisconsin's food, fiber, and ornamental plant products
<b>AE - Agricultural Education</b>	<b>AE:D - Agriscience/Production</b>	<b>AE:D12-3</b> - Understand how public policy affects the food, fiber, and ornamental plant industries
<b>AE - Agricultural Education</b>	<b>AE:D - Agriscience/Production</b>	<b>AE:D12-4</b> - Explore traditional and nontraditional food, fiber, and ornamental horticultural jobs/careers and identify the necessary skills, aptitudes, and abilities
<b>AE - Agricultural Education</b>	<b>AE:D - Agriscience/Production</b>	<b>AE:D12-5</b> - Describe how biotechnology can enhance food and fiber production
<b>AE - Agricultural Education</b>	<b>AE:D - Agriscience/Production</b>	<b>AE:D12-6</b> - Understand the impact emerging technologies within hydroponics, aquaculture, and biotechnology have on the food and fiber industries and natural resources
<b>AE - Agricultural Education</b>	<b>AE:E - Ecology/Environment</b>	<b>AE:E12-1</b> - Understand the application of agricultural technologies that can sustain production while reducing environmental impact
<b>AE - Agricultural Education</b>	<b>AE:E - Ecology/Environment</b>	<b>AE:E12-2</b> - Analyze benefits, costs, and consequences of land use
<b>AE - Agricultural Education</b>	<b>AE:E - Ecology/Environment</b>	<b>AE:E12-3</b> - Explain the impact of climate change on existing agricultural systems
<b>AE - Agricultural Education</b>	<b>AE:E - Ecology/Environment</b>	<b>AE:E12-6</b> - Analyze benefits, costs, and consequences of processing food and fiber on the environment

## Academic Standards Lookup Table:

Core Area	Content Standard	Performance Standard
Sci - Science	Sci:A - Science Connections	<b>Sci:A12-5</b> - Show how the ideas and themes of science can be used to make real-life decisions about careers, work places, life-styles, and use of resources
Sci - Science	Sci:B - Nature of Science	<b>Sci:B12-1</b> - Show how cultures and individuals have contributed to the development of major ideas in the earth and space, life and environmental, and physical sciences
Sci - Science	Sci:B - Nature of Science	<b>Sci:B12-4</b> - Show how basic research and applied research contribute to new discoveries, inventions, and applications
Sci - Science	Sci:C - Science Inquiry	<b>Sci:C12-2</b> - Identify* issues from an area of science study, write questions that could be investigated*, review previous research on these questions, and design and conduct responsible and safe investigations to help answer the questions
Sci - Science	Sci:D - Physical Science	<b>Sci:D12-4</b> - Explain* how substances, both simple and complex, interact* with one another to produce new substances
Sci - Science	Sci:D - Physical Science	<b>Sci:D12-5</b> - Identify* patterns in chemical and physical properties and use them to predict* likely chemical and physical changes and interactions
Sci - Science	Sci:D - Physical Science	<b>Sci:D12-6</b> - Through investigations*, identify* the types of chemical interactions*, including endothermic, exothermic, oxidation, photosynthesis, and acid/base reactions
Sci - Science	Sci:E - Earth and Space Science	<b>Sci:E12-4</b> - Analyze* the benefits, costs, and limitations of past, present, and projected use of resources and technology and explain* the consequences to the environment
Sci - Science	Sci:F - Life and Environmental Science	<b>Sci:F12-1</b> - Evaluate the normal structures and the general and special functions of cells in single-celled and multiple-celled organisms
Sci - Science	Sci:F - Life and Environmental Science	<b>Sci:F12-2</b> - Understand how cells differentiate and how cells are regulated
Sci - Science	Sci:F - Life and Environmental Science	<b>Sci:F12-3</b> - Explain current scientific ideas and information about the molecular and genetic basis of heredity
Sci - Science	Sci:F - Life and Environmental Science	<b>Sci:F12-4</b> - State the relationships between functions of the cell and functions of the organism as related to genetics and heredity
Sci - Science	Sci:F - Life and Environmental Science	<b>Sci:F12-5</b> - Understand the theory of evolution, natural selection, and biological classification
Sci - Science	Sci:F - Life and Environmental Science	<b>Sci:F12-6</b> - Using concepts of evolution and heredity, account for changes in species and the diversity of species, include the influence of these changes on science, e.g. breeding of plants or animals

<b>Sci - Science</b>	<b>Sci:F - Life and Environmental Science</b>	<b>Sci:F12-10</b> - Understand the impact of energy on organisms in living systems
<b>Sci - Science</b>	<b>Sci:F - Life and Environmental Science</b>	<b>Sci:F12-11</b> - Investigate how the complexity and organization of organisms accommodates the need for obtaining, transforming, transporting, releasing, and eliminating the matter and energy* used to sustain an organism
<b>Sci - Science</b>	<b>Sci:G - Science Applications</b>	<b>Sci:G12-3</b> - Analyze the costs, benefits, or problems resulting from a scientific or technological innovation, including implications for the individual and the community
<b>Sci - Science</b>	<b>Sci:H - Science in Personal and Social Perspectives</b>	<b>Sci:H12-5</b> - Investigate how current plans or proposals concerning resource management, scientific knowledge, or technological development will have an impact on the environment, ecology, and quality of life in a community or region
<b>SS - Social Studies</b>	<b>SS:E - Behavioral Sciences</b>	<b>SS:E12-9</b> - Defend a point of view related to an ethical issue such as genetic engineering, declaring conscientious objector status, or restricting immigration